

# HEALTH PROMOTION IN A PRIMARY HEALTH CARE SETTING

## Neural Tube Defects and Folate

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**Abstract:** Primary care practitioners are ideally situated to carry out health promotion activities. Neural tube defects are of a fairly low incidence, but the consequences are tragic. They range from life long physical and often intellectual disabilities, to death at birth. Increased folate intake, either through eating folate rich foods or through supplementation, has been shown to reduce the incidence of neural tube defects in newborns by up to 75%. Encouraging all women of child-bearing age to increase their folate intake could thus prevent a significant number of neural tube defects occurring in the Australian population.

**Key Indexing Terms:** Primary health care, neural tube defects, folate.

### INTRODUCTION

Primary care practitioners see a variety of people from all age groups and all backgrounds, and are ideally placed to carry out opportunistic health promotion programs. The chiropractor or osteopath can use their general health knowledge, as well as their manual therapy skills, to improve the health profile of those patients who attend for treatment.

Neural tube defects are a group of congenital anomalies that include anencephaly, spina bifida and encephalocele. They are all characterised by abnormal development of the neural tube (the precursor of the spinal cord) during early embryonic life, usually accompanied by defects of the vertebral column or skull. In normal development a plaque of nerve tissue forms along the surface of what will become the back of the foetus. This tissue folds into a closed tube that develops into the structures of the central nervous system. Malformations occur either because the tube fails to close properly, because parts of it are missing, or because part of the tube is blocked.

Children born with anencephaly, which is a lack of part or whole of the brain and cranium, are stillborn or die soon after birth. Encephalocele occurs when a meningeal sac containing brain tissue protrudes from the skull, and the outlook for affected individuals depends upon the amount of nervous tissue involved. Spina bifida and

other abnormalities of closure of the vertebral arches, result when part of the spinal cord is left uncovered by the skin, or actually protrudes from the spinal column. Children born with the more serious forms of spina bifida experience paralysis in those parts of the body below the site involved. The legs may be completely paralysed, and bladder and bowel functions may be absent or impaired (1).

### Incidence of Neural Tube Defects

The overall rate of neural tube defects for all of Australia has been estimated at 1.9 per thousand births (2). Over 95% of pregnancies with neural tube defects occur in women without a previous affected pregnancy (3). Women who have had a previous pregnancy with a neural tube defect have a significantly increased risk of recurrence, in the order of 40-50 per thousand births.

### Association between Folate and Neural Tube Defects

Folate, or folic acid, is a vitamin of the B complex. In humans, folate is necessary for the synthesis of nucleic acids and the formation of red blood cells. Its major sources in the human diet include green leafy vegetables, whole grains and legumes. The recommended daily allowance of folate is 500mg per day.

There is increasing evidence that periconceptional folate has a role in the formation of neural tube defects. Although the mechanism is not known, increased consumption of folate through diet or supplementation before and during pregnancy reduces the number of neural tube defect affected pregnancies. Between 1980 and 1995, fourteen human studies of varied design have collectively demonstrated that increased intake of folate at the start of pregnancy can reduce the incidence of neural tube defects by about 75% (4). The evidence from two of these studies is unequivocal, with two randomised controlled trials showing a decreased incidence of neural tube defects in both previously affected and unaffected pregnancies (3,5). Previous and subsequent studies are confirmatory of this result (6,7,8). These studies have shown a protective effect of either dietary folate or supplementary folic acid. Only one study published has failed to show a relationship between periconceptional folate and neural tube defects (9). This paper was a case control study and has been superseded by the more recent, and experimentally stronger, randomised control trials.

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There is also some evidence that the use of folate can benefit the health of the general population, as well as women of child-bearing age. It has recently been suggested that folate may reduce the risk of cardiovascular disease (10), and may also have a role in the protection against colon, uterine and cervical cancers (11).

### Problems with the Use of Folate

The use of folate supplementation is not known to cause any significant problems. Folate is not known to be toxic. Even in large doses, folic acid has not been shown to cause harm (12). There are, however, two areas of concern. The first is that the use of folic acid may complicate the diagnosis of vitamin B12 deficiency in certain people (13). Folic acid intake may mask the anaemia that accompanies the irreversible damage that occurs due to a deficiency of vitamin B12. However, vitamin B12 deficiency disease of the nervous system is not diagnosed any longer by waiting for anaemia to occur. Primary care practitioners are trained to recognise the syndromes that could be due to vitamin B12 neuropathy, such as peripheral nerve damage, and therefore to send off for plasma levels of vitamin B12 before significant damage could occur (14). The second concern is that folic acid may interfere with epilepsy medication (12). This is only relevant when taking high doses of folic acid, and may therefore be monitored closely in such patients. In general, however, data suggesting that folic acid supplementation is unsafe, are weak and consist predominantly of case series and reports (15).

A recent article in the Lancet (16) contemplates recent findings from the original Czeizel and Dudas (5) study that suggests an increased rate of abortion in women who take folic acid supplementation. The authors concluded that the benefit of reducing neural tube defects far outweighed the dangers. They also suggested that the findings might actually be due to folic acid being able to assist in terathanasia, in that the mother selectively aborts affected fetuses. Thus, folic acid may prevent some defects indirectly through terathanasia, and directly by inhibiting the formation of neural tube defects.

### Awareness of the Folate and Neural Tube Defect Association in Women

Knowledge in the community of the relationship between folate and neural tube defects is low. Two studies found in the literature reported on this. The Morbidity and Mortality Weekly Review (17) reported on a telephone survey of reproductive-aged women. The study found that 71% of the women surveyed did not know that folic acid can prevent some birth defects, and only 20% consumed a multivitamin containing adequate amounts of folate per day. A study conducted in Western Australia,

as part of a health promotion program, surveyed women of child-bearing age to determine their knowledge of folate and spina bifida (18). Only 8.2% of the women surveyed stated the correct association between folate and spina bifida. These studies highlight the need for education of women of child-bearing age to increase the awareness of the association between folate and neural tube defects. Knowledge is the first step in changing a community's behaviour.

### Health Promotion

Health promotion aimed at women who are planning a pregnancy would be imperative in the reduction of neural tube defect affected pregnancies. However, in Australia a large proportion of pregnancies are unplanned (19), and women would therefore not necessarily be aware of the protective effect of folate before they became pregnant. The human neural tube normally closes by the end of the third week after conception, and thus any influence affecting the closure of the neural tube must be present before this occurs. These two facts stress the need that education from a primary care practitioner must be aimed at all women of child-bearing age to be effective.

The table indicates from which foods folate is readily obtainable. Encouraging all women of child-bearing age to increase their folate intake must involve practical and simple steps to ensure compliance. Eating foods rich in folate, or the supplementation of 500mg of folate daily, would adequately meet the need to reduce the chance of a neural tube defect pregnancy. Women who have

Table: Foods rich in folate\*. To obtain the adequate amount of folate per day requires 2 serves of these fruits, 5 serves of these vegetables and 7 serves of bread and cereal.

<i>Excellent food choices</i>	<i>50-80 µg per serve</i>
Asparagus	3 spears
Brussel sprouts, steamed	½ cup
Dried beans/chick peas, boiled	½ cup
Endive lettuce	½ cup
Liver, chicken	100g
Vegemite/marmite	1 teaspoon
<i>Very good food choices</i>	<i>25-50 µg per serve</i>
Broccoli/cauliflower	½ cup
Green beans/peas, steamed	½ cup
Oranges/orange juice	1 fruit
Porridge	½ cup
Potato	100g
Wheatgerm, wheat bran	2 tablespoons
Wholegrain bread	2 slices
<i>Good food choices</i>	<i>10-25 µg per serve</i>
Bananas	1 medium fruit
Nuts: almonds, cashews, hazelnuts, peanuts	30g
Tomato	½ fruit
Salmon, tinned	100g

\*Table adapted from a pamphlet produced by the New South Wales Health Department.

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previously had an affected pregnancy, or have a close family history of neural tube defects, should take a supplement of 5mg of folate daily for at least one month before, and for the first three months of pregnancy. Taking folate in such large doses should not be obtained from multivitamin tablets because the intake of other vitamins, especially vitamin A, would then be too high.

### CONCLUSION

Chiropractors, osteopaths and other primary health care practitioners have a responsibility to pass on the findings of scientific research to their patients. This is especially true in the case of women consuming adequate amounts of folate before attempting to become pregnant. Research has shown unequivocally that an increased intake of folate before conception reduces the incidence of neural tube defects. For women who have had a previously affected pregnancy this is even more essential. When encouraging an increase in folate intake, practitioners should be aware of any potential problems that may arise. Practitioners should carefully monitor any women at an increased risk of vitamin B12 deficiency, such as vegans, for any signs and symptoms of neurological damage at any time, but even more so when consuming extra folate. Women who are taking epileptic medication should take folate supplementation with care, as folate may interfere with the absorption of the medication.

A reduction in the incidence of neural tube defects in the newborn would lead to improved social, emotional and financial consequences for the community in general, and the reduction of unnecessary heartache and cost to the families potentially involved.

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